

# Memory-Based GATE 2024 XE Question Paper and Answer Key

1. Velocity profile of a fluid flow is given as  $u = a / (b-x)^2$ . If  $a = 8\text{m}^3/\text{s}$ ,  $b = 4$ ,  $x=2\text{m}$ , what is the magnitude of acceleration?

**Ans:  $a = 4$**

2. What is the correct relation between Darcy's friction factor and fanning friction factor?

**Ans:  $f = 4f'$**

3. The velocity potential function of a flow field is given by  $\Phi = (axy + bx^2 - by^2)$  where constants  $a = 2/\text{s}$  and  $b = 0.5/\text{s}$ . What will be the magnitude of velocity at the point  $x = 2$ ,  $y = 1\text{ m}$ ?

**Ans:  $v = 5$**

4. What is the hydrodynamic diameter of a circular pipe of radius R?

**Ans:  $4R$**

5. What is the vorticity component in the y-z plane?

**Ans:  $2W_x$**

6. What is the dimension of pressure?

**Ans:  $(ML^{-1}T^{-2})$**

7. In a simple Couette Flow, the lower plate is stationary and the upper plate is moving with a speed  $1\text{ m/s}$ . The distance between the plates is  $1\text{ cm}$ . The viscosity is  $10^{-3}\text{ Pa}\cdot\text{s}$ . Find the shear stress required?

**Ans:  $0.1\text{ Pa}$**

8. In a drag force test of a  $1/8$  model prototype, the actual velocity of the car is  $16\text{ m/s}$ . The velocity of the model car is?

**Ans:  $128\text{m/s}$**

9. At certain places atmospheric pressure is 700 mm of Hg and the absolute pressure is 400 mm of Hg. What is the vacuum pressure \_\_\_\_ mm of Hg?

**Ans: 300**

10. Incompressible fluid flowing over a flat plate in x-direction. What is the pressure gradient along the flow direction?

(a) Positive (b) Constant (c) Negative (d) None

**Ans: Negative**

11. An article is sold at 10% profit after that it is sold at 10% loss. Find the overall profit and loss

(a) Positive (b) Constant (c) Negative (d) None

**Ans: 1% LOSS**

12. P and Q are two matrices of the same order.  $(P+2Q)^2 =$  \_\_\_\_\_?

(a)  $(P+2Q)(2Q+P)$  (b)  $P^2 + 4Q^2 + 4PQ$  (c)  $P^2 + 4Q^2 + 2PQ + 2PQ$  (d)  $P(P+2Q) + Q(P+2Q)$

**Ans: (c)  $P^2 + 4Q^2 + 2PQ + 2PQ$**